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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

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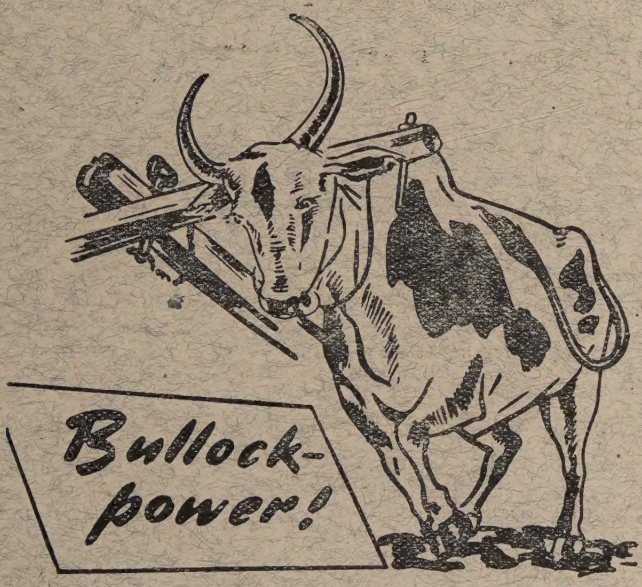
Vol. XXI] 1942-43 [No. 2



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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XXI] OCTOBER—DECEMBER 1942 [No. 2

Improved Varieties of Cotton Grown in the Mysore State

BY

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The extension of cotton cultivation during these few years has been very rapid. It was found after repeated trials that good varieties of cotton could be successfully and profitably grown in the irrigated tracts and also on red loamy soils under rain-fed conditions. This Department undertook recently an intensive and strenuous propaganda with the result that nearly 10,000 acres have been sown with improved varieties. Cotton as a money crop and as an alternative to sugarcane is being taken up seriously in some of the newly opened irrigated tracts of the Irwin Canal. In the dry regions (where cotton cultivation was unheard of before), on red loamy soils and under rain-fed conditions, ryots are keen in taking up cotton cultivation as this crop augments their income. In the Banavar area, famous for its cotton cultivation, new strains are rapidly replacing the older ones—*Local Doddahatti* and *Gadag* cottons—on account of their disease-resistance and better out-turn.

The following are some of the important new varieties, of which some occupy large areas and others are in process of rapid multiplication prior to distribution.

Mysore-American Cottons

M.A. II.—This variety, evolved by the late Economic Botanist, is rapidly replacing the *Local Doddahatti* and *Gadag* cottons in the Banavar area. It is also popular in the several taluks of Mysore District. Seeds to cover an area of 4,000 acres in Banavar, Mysore and Chitaldrug tracts have been distributed. It is an early maturing,

and can spin upto 34 highest standard warp counts. The ginning percentage is 35-36. Its value is Rs. 310 on Broach Rs. 175.

Co. 3.—It is the resultant of a cross between A. 12 × Co. 2. This has a very vigorous habit but yields less than Co. 4. It has a creamy colour with a 'silky' feel, and a 'good' staple length. It spins upto 40 highest standard warp counts, which is definitely a better spinning performance than that of Co. 4. Its contract value is less than that of Co. 4, but the value of this goes up if some of the yellow spots seen on the lint are picked off. This variety has done well in the Banavar area and seeds to cover an area of nearly 250 acres have been issued.

Egyptian Cottons

Since the soil and climatic conditions prevalent in the State are found suitable for growing successfully long-stapled cottons—Giza 7 and Giza 12 were imported and tried on 7 acres at Irwin Canal Farm and on a smaller extent at Babbur Farm. Although these cottons were tried in the first instance, out of season, the yield 450-500 lbs. per acre obtained at Irwin Canal Farm compared very favourably with other cottons grown during the same time. On the other hand, these Egyptian cottons were planted during favourable season—July—at Babbur Farm and gave a yield of 1,100 lbs. per acre. Seeds of the acclimatised varieties are now being grown on an increased area with a view to furthering distribution during the next season.

Giza 7—Possesses a "creamy white to creamy" lint with a 'soft, silkish' feel. Its staple strength is 'good' and is adjudged suitable for spinning upto 70 highest standard warp counts and classed as 'fine'. Its staple is 1 3|8" and has a ginning percentage of 35. Its value is Rs. 460 on Broach Rs. 165.

Giza 12.—It is classed as "fully good to fine" and is a little brownish in colour with a 'soft silkish' feel. Its staple strength is 'good' and is adjudged good for spinning upto 60 highest standard warp counts. It is valued at Rs. 410 on Broach Rs. 165.

Asiatic Cottons

In the black-cotton soil areas of Chitaldrug and Mysore districts, some of the improved departmental varieties have occupied large areas. Recently several exotic Asiatic cottons like N. 14, C. 7, Late Veerum, Gaorani, K. 1 and 1027 A.L.F. have been introduced. Of these, K. 1, C. 7 and 1027 A.L.F. have given very good yields during repeated trials and are now being distributed to the ryots.

Sel. 69.—This is an improved strain isolated from Kumpta cotton—*G. herbaceum* var. *frutescens* and has spread over an area of 10,000 acres in Chitaldrug District. The lint colour is "white" with a roughish feel. It has good staple strength with a staple length of ¾" and spins upto 21 highest standard warp counts. It is valued at Rs. 60 on Broach Rs. 225. It yields about 250-300 lbs. per acre and has a ginning of 26-28 per cent.

H. 190.—This is a hybrid obtained as a cross between *G. herbaceum* var. *frutescens* and *G. arborium* var. *sanguineum.* The lint is white and 'silkish' in feel. Its staple length is 13|16", the strength is good and is capable of spinning upto 23's highest standard warp. It yields on the average 250-300 lbs. per acre and occupies an area of nearly 6,000-7,000 acres. It is valued at Rs. 75 on Broach Rs. 225.

Str. 199.—This is a hybrid obtained by double hybridization between strain 19 and C.N. 86. It has a white lint with "silkish" feel. The spinning performance of this strain is definitely superior to those of Sel. 69 and H. 190. The staple strength is considered 'good' and spins upto 40 highest standard warp counts. The yarns obtained are rather 'neppy'. The strain is under multiplication and so far it has given on the average about 250 lbs. per acre. It is valued at Rs. 70 on Broach Rs. 225.

In addition to the abovementioned varieties, this Department is actively pursuing the acclimatisation of some of the world's longest-staple cottons. It is also intensively engaged in evolving new strains suitable to our conditions by hybridization and selection. It has been repeatedly pointed out that there is a large annual deficit by heavy imports of cottons into the State and the demand for long- and medium-stapled cottons still continues. This State with its perennial source of irrigation in the irrigated tracts and good rainfall in the non-irrigated zones can afford to grow more cotton. By the extension of cotton cultivation it is possible not only to make up the annual deficit but place Mysore in a position to export on a large scale, thereby enriching the State and its people.

Groundnut in Mysore

BY

K. Gopala Iyengar and R. S. Iyengar

I

Groundnut, a familiar product, is not a true nut like the almond or walnut; but is a bean or pea-like pod borne underground. Hence, its popular names such as earthnut and peanut. It is a legume belonging to the group of *Avare* (*Dolichos lablab*) and *Hurali* (*Dolichos biflorus*) of the natural order *Leguminosæ* and is technically known as *Arachis hypogæa* Linn. The genus *Arachis* comprises some seven to ten species, of which only the cultivated races of *Arachis hypogæa* are of commercial importance.*[1]

The native home of groundnut appears to be South America particularly Brazil where, in addition to the cultivated races of *A. hypogæa,* several other species, both wild and cultivated, like *A. sylvestris, A. rasterio* and *A. nambyquaræ,* are found. The discovery of the New World and the ever-increasing commerce with it, was responsible for the introduction of groundnut to various other parts of the world. From Brazil, the Portuguese carried it to Africa and the Spaniards introduced it to the Far East, especially

Area, production and yield of groundnuts in the world

Average of 1933 to 1937 (nuts in shell)*

Country	Area in		Production in		Yield per acre in lbs.
	Thousand acres	Percentage share	Thousand tons	Percentage share	
India	7,000	36·2	2,822	34·4	903
Burma	717	3·6	155	1·9	476
China	3,574	18·5	2,672	32·6	1,674
Senegal	1,636	8·5	538	6·6	736
Nigeria	895	4·6	337	4·1	843
Gambia	300	1·5	60	0·7	448
U.S.A.	1,661	8·6	540	6·6	728
Others	3,568	18·5	1,079	13·1	..
TOTAL ..	19,351	100·0	8,203	100·0	..

* Adapted from the *International Review of Agricultural Statistics,* 1938-39.

* Figures in parenthesis refer to literature quoted. The first citation is indicated completely in the foot-notes and subsequent ones merely by numerals.

[1] Badami, V. K., "Botany of Groundnut," *J. Mys. Agri. Exptl. Union,* 1935, **14**, 4, pp. 188-194; and **15**, 2 & 3, pp. 59-70.

Philippines, from Peru. From these introductions, the cultivation of groundnut has spread and established itself in most tropical and many sub-tropical countries.[2]

India and China are the important groundnut producing countries in Asia; Senegal, Nigeria and Gambia in Africa and the United States in America.

In addition the crop is extensively cultivated in many other countries. Of secondary importance are Java, Sumatra, Indo-China, Philippines, Formosa and Japan in Asia; Egypt, Tanganyika, Kenya, Congo, Mozambique, Madagascar, The Union of South Africa and Guinea in Africa; Queensland and the Northern Territory in Australia; Spain and Bulgaria in Europe; and Argentina, Mexico, Paraguay and Uruguay in America.[2] At present, the area under groundnuts in the world is estimated to be just over 20 million acres and the total production about 8.5 million tons of nuts in shell.

India is the foremost groundnut-producing country in the world, accounting for over 36 per cent. of the acreage and 34 per cent. of the production.[3] Though the introduction of groundnuts into India took place as early as the sixteenth century, its spread was extremely slow up to the commencement of the present century. In 1900, the area under this crop was about 3 lakhs of acres, which has expanded to nearly 90 lakhs of acres at the present time. This is the only example of a crop in India, which from a humble beginning has grown to such phenomenal dimensions in so short a time as forty years. The total production has also kept pace with the expansion of area.

*Acreage under groundnuts in the main producing areas of India**

(Thousand acres)

Acreage of	1900–01 to 1909–10	575
„	1910–11 to 1919–20	1,498
„	1920–21 to 1929–30	3,643
„	1930–31 to 1939–40	6,898

* From the *Report on the Marketing of Groundnuts in India and Burma.*

"The acreage in the main producing areas of today is about 30 times what it was in the beginning of the century and more than four times what it was before the 1914-18 war."

The quantity of groundnuts produced in India during 1900-01

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[2] Badami, V. K., "*Arachis hypogæa* Linn., Groundnut or Peanut. Original habitat and its distribution in the world," *J. Mys. Agri. Exptl. Union,* 1936, **15**, 4, pp. 141-154.

[3] ———, *Report on the Marketing of Groundnuts in India and Burma,* 1941, Government of India, Simla.

was 1.22 lakhs of tons. At present the annual production is to the tune of 33 to 34 lakhs of tons.

Of the Indian production, about 35 to 40 per cent. is placed on the export market, the chief markets being[3] United States of America, Netherlands, France, Germany, etc.

Share of different countries in the total export of groundnuts (mostly kernels) from India

Average—1933-34 to 1937-38

Country	Percentage share
United Kingdom	17·2
France	22·6
Germany	16·1
Netherlands	20·1
Italy	11·7
Belgium	4·4
Egypt	3·5
Others	4·4
TOTAL ..	100·0

In addition to the export of kernels, about 5,000 tons of oil and 2 to 4 lakhs of tons of cake are exported every year. The chief markets for oil are the United Kingdom, Ceylon, Straits Settlements and Mauritius. The exports of cake are mostly to United Kingdom and Germany.[3]

Share of different countries in the exports of groundnut cake from India

Average—1933-34 to 1937-38

Country	Percentage share
United Kingdom	56·5
Germany	18·3
Belgium	9·1
Netherlands	7·5
Ceylon	4·3
Others	4·3
TOTAL ..	100·0

Though India has a leading export trade in groundnuts, she also imports small quantities of nuts, oil and cake. Imports of nuts, mostly in shell range from nil to a few hundred tons per year, the chief sources of supply being Portuguese East Africa and Straits

Settlements. Imports of oil range from 5 to 45 tons per year, supplies being mainly derived from Straits Settlements and Ceylon, and from the United Kingdom in stray years. Imports of cake are infrequent and the quantity negligible.

The share of the various Provinces and States of India in the groundnut crop is as follows[3]:—

Acreage, production and yield of groundnut in India

Average—1933-34 to 1937-37

State or Province	Average acreage 70·00 lakhs of acres	Average production 28·22 lakhs of tons of nuts in shell	Yield per acre in lbs. of nuts in shell
	Percentage	Percentage	
Madras	48·0	53·9	1,014
Hyderabad	16·9	14·0	747
Bombay	15·4	16·8	987
Bombay States	10·4	8·2	713
Mysore	2·9	1·4	446
C.P. and Berar	2·4	1·7	606
Other Provinces and States	4·0	4·0	905
TOTAL ..	100·0	100·0	903

As indicated in the table above, the average area in Mysore is estimated to be 2.03 lakhs of acres and the production as 39,508 tons of nuts in shell. Though the State possesses 2.9 per cent. of the Indian acreage, her share in production is only 1.4 per cent. This is due to the very low estimated yield of 446 pounds per acre, a figure which makes Mysore occupy the lowest place as regards yield per acre in India. In the adjoining Provinces of Madras and Bombay, the yield per acre is more than twice that of Mysore, and is about 67 per cent. greater in the neighbouring State of Hyderabad. But the Department of Industries and Commerce in Mysore has estimated the yield per acre of groundnut in the State for the year 1938-39[4] to be 1,000 lbs. of nuts in shell. The area occupied during that year being 214,669 acres, the total quantity produced is 95,834 tons of nuts in shell.

Groundnut cultivation holds a prominent position amongst the oil seeds grown in Mysore. The various oil seeds raised and the area under them in Mysore during 1938-39 is as follows:—

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4 *Report on Oil Seeds Crushing Industry in Mysore*, 1941. Government of Mysore, Bangalore.

Kind of oil seed	Area in acres
Groundnut	214,669
Cocoanut	174,389
Castor	99,373
Cotton	83,588
Gingelly	85,352
Niger	10,721
Rape and mustard	4,637
Other oil seeds	39,742
Total area under oil seeds ..	712,471

On an average, the area under oil seeds amounts to 7.17 lakhs of acres, which represents 11.2 per cent. of the total net area cropped. "Sixty-seven per cent. of this area under oil seeds lie in the districts

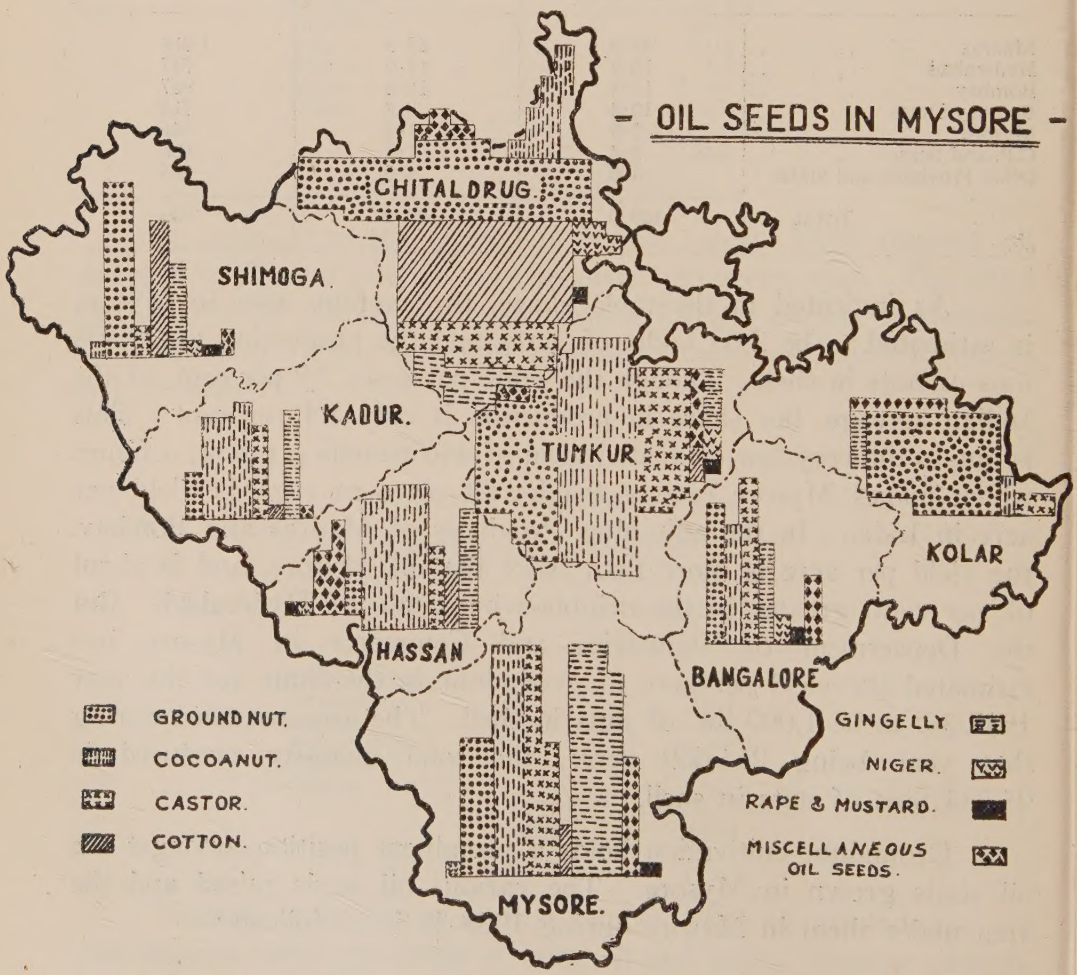

FIG. 1. Map of Mysore, showing the relative area under important oil-seeds in the several districts. (Mysore also includes Mandya.)

AREA OF PRINCIPAL OIL SEEDS IN THE DISTRICTS

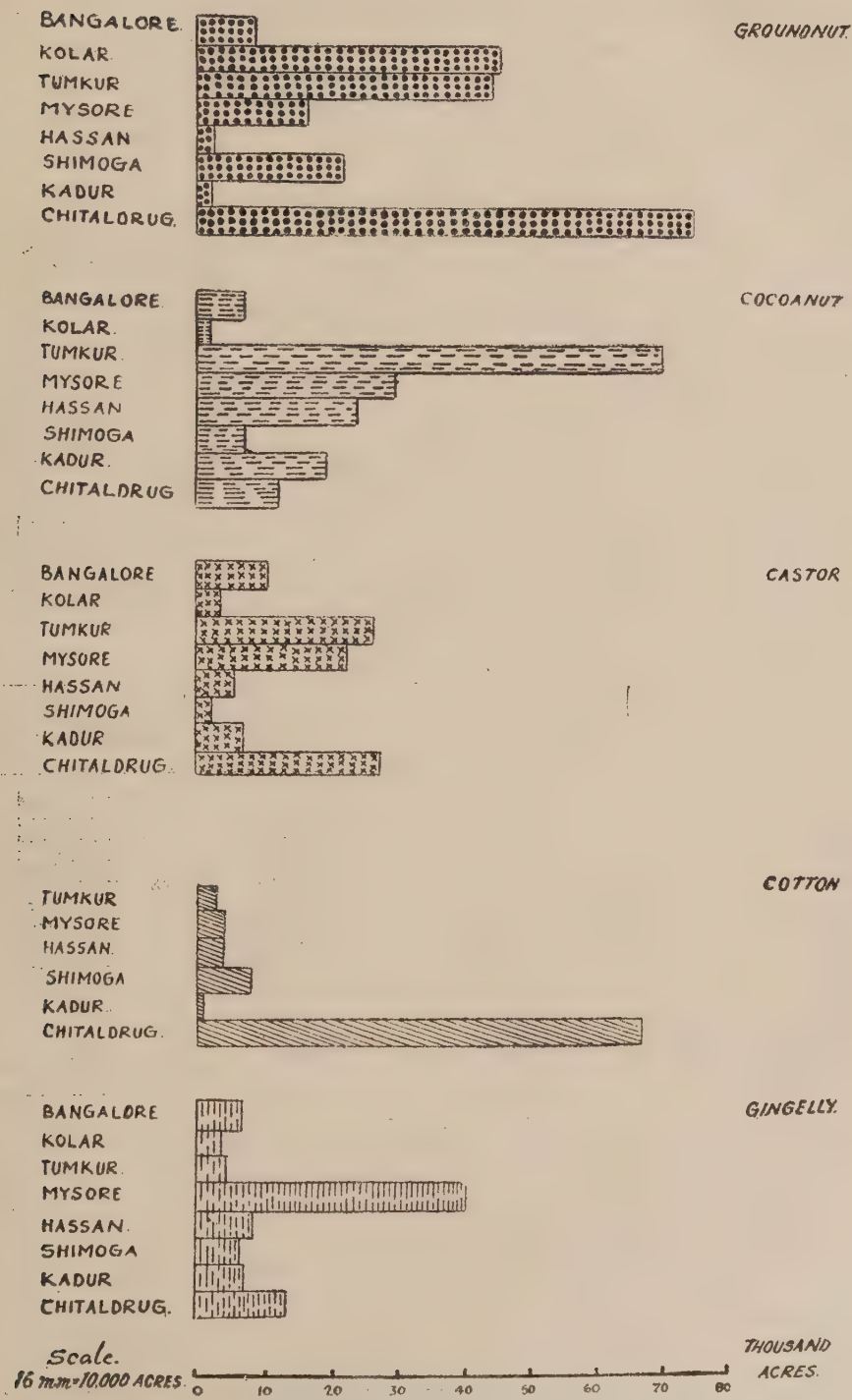

FIG. 2. (Mysore includes Mandya)

of Chitaldrug, Tumkur and Mysore. Hassan, Kolar, Shimoga, Bangalore and Kadur account for the rest. ... During the last ten years the area under cocoanut has steadily increased and the acreage under groundnut and castor has decreased by 34 per cent. and 7 per cent. respectively. The decrease has been attributed to the low and unremunerative prices and to the varieties of oil seeds which give poor yield, for want of proper manuring and attention to other cultural operations and timely rains. ... The dependence of the ryot for seeds on local *dallal* is also a cause for gradual decline in the acreage under oil seeds. The importation of oil seeds at a cheaper rate from outside and re-exporting it is also one of the causes for this decrease in the acreage."[5] Generally, oil seeds form an important cash crop to the dryland cultivator. In some parts of the State they are the only cash crops which the ryot is able to raise. The relative importance of the area under principal oil seeds in the districts, may be made out by a reference to Figs. 1 and 2.

Among the oil seed crops of the State, the area under groundnuts is the most extensive. The relative position of groundnut with reference to the area under oil seeds and the total area under cultivation, may be gauged by the table given below.

Season	Area under Groundnut	Area under Oil seeds	Total net area cropped in acres
1929–30	323,738	784,815	6,635,197
1930–31	313,912	777,862	6,646,289
1931–32	270,936	742,933	6,568,281
1932–33	283,586	776,465	6,629,449
1933–34	254,096	735,498	6,564,472
1934–35	163,211	613,842	6,064,856
1935–36	187,471	668,609	6,313,561
1936–37	198,086	678,285	6,320,226
1937–38	198,188	682,871	6,243,179
1938–39	214,669	712,471	6,306,378
Annual acreage	240,789	717,365	6,429,188
Percentage share of groundnut area in	..	33·5	3·7

(To be continued)

[5] Dorasami, L. S., "The Present Position of Oil Seeds and Their Future Scope in Mysore State," *J. Mys. Agri. Exptl. Union*, 1940, **19**, 1, pp. 1-6.

Notes on Breeding *Elettaria cardamomum* Maton.

BY

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Cardamom breeding is being worked at the Government Coffee Experiment Station, Balehonnur, in addition to coffee breeding. Prior to 1936 only plant material was collected from throughout South India. Since 1936 the material collected has been utilised for systematic study and breeding. The results of the systematic study are the description of four varieties of cultivated cardamoms (Narasimha Swamy, 1940). The present note records observations on the characters of the cross-bred progeny.

Some of the observations on the cross-bred progeny are interesting; further, since it takes a long time to publish very comprehensive data regarding breeding such a perennial crop as cardamom, it is intended to record periodically the results of the work.

The aims of cardamom breeding at the Station are the evolution of a vigorous plant with healthy growth, being resistant to particularly *Katte* disease, and producing a good crop of quality fruits. In addition, resistance to *Kajji* diease due to attack by thrips, is also kept in view. The difficulties of breeding such a plant are evident especially when it is remembered that cardamom is a perennial crop coming into bearing from its third or fourth year from sowing. Therefore, a fairly long time is required to raise even a few generations. However, the results that have been obtained by the first crosses at the Station coupled with the comparative ease with which cardamom can be vegetatively multiplied fills one with hope for the future.

Elettaria cardmomum Maton. varieties, *Mysorensis, Laxiflora, Major* and the type of the species have been intercrossed. The crossings effected are:—

Female parent	Male parent	Family No. of F_1	No. of plants in the family
Manjarabad (type)	S. 42 (*Mysorensis*)	36	43
Do.	S. 35 (*major*)	37	29
S. 52 (*major*)	Manjarabad (type)	85	27
S. 43 (*Laxiflora*)	S. 42 (*Mysorensis*)	38	20

The characters of the parents of these crosses are described below:—

Characters	Manjarabad	S. 43	S. 42	S. 35 or S. 52
Height of leaf-stalks ..	7 ft.	9 ft.	14–16 ft.	16–18 ft.
Undersurface of leaves ..	Pubescent	Glabrous	Glabrous	Glabrous
Nature of inflorescence growth ..	Spreading and short	Spreading and short	Erect and long	Erect and long
Vigour of the plant ..	Not vigorous	Not vigorous	Vigorous	Vigorous
Health of the plant ..	Susceptible to *Katte* disease	Susceptible to *Katte* disease	Resistant to *Katte* disease	Resistant to *Katte* disease
Cropping	Medium	Medium	Poor	Poor

Characters Study

Height of Leaf Stalks.—In all the F_1 families of the crosses there seems to be a definite improvement in height over the Manjarabad or *Laxiflora* parents. None of the plants in the F_1 progeny is so short as these parents. Further, the F_1 progeny have vigour and health that are comparable with either *Mysorensis* or *Major*.

Pubescence of the Undersurface of Leaves.—Families 37 and 85 have glabrous leaves. These are crosses between plants with pubescent and glabrous leaves. Since the F_1 progeny have glabrous leaves the dominance of glabrous over pubescence is suggested. This is supported in the selfed progeny of S. 42 in which there are 22 plants with glabrous leaves, and 9 plants with pubescent leaves. This segregation in the family is not inconsistent with a 3 : 1 ratio.

Characters of Inflorescences.—Plants in families 37 and 85 have semi-erect inflorescences, *i.e.*, the inflorescences tend to be erect at first but later, as they increase in length bend down thus having a semi-erect growth. The inflorescences in these families are also long like variety *Major*.

Finally, the characters in the crosses between Manjarabad and S. 35 and S. 52 may be elaborated:

Characters	Manjarabad plant	S. 35 and S. 52	F_1 plants	Family No.
Height of leaf-stalks	7 ft.	16–18 ft.	9–13½ ft.	37 and 85
Vigour	Not vigorous	Vigorous	Vigorous	Do.
Undersurface of leaves ..	Pubescent	Glabrous	Glabrous	Do.
Inflorescence	Spreading on the ground and short	Erect and long	Semi-erect and long	Do.
Cropping	Medium	Poor	Good	Do.

The families 37 and 85 indicate that the height of leaf stalks and nature of the inflorescence are about midway between the two parents; the F_1 plants are more vigorous than the Manjarabad parent and are comparable with var. *Major*; glabrous undersurface of leaves is dominant and, while S. 35 and S. 52 are poor croppers the F_1 plants in the family 37 are all good croppers.

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SELECTIONS, ABSTRACTS AND EXTRACTS

I

The Distinguishing Features of the Amrit Mahal Breed

The head is long and tapering towards the muzzle, which is generally black. The forehead bulges out beyond the line of the elongated nose like the foreheads of many young calves of other breeds.

The horns are set well back on the crest of the frontal bone; they spring close together like the horns of a goat, then diverge and incline backwards each in a straight line for fully half the length, when with a gentle and peaceful curve they bend upwards and usually slightly inwards towards their terminations, which are black-tipped, and exceedingly sharp. At times when the head is down, as when feeding, the horns touch or almost touch the neck in front of the hump. They thicken gradually as the head is approached, and are very strong near the base which seem to extend, apparently to give strength, down the forehead between the eyes, as a distinct ridge on each side, thus forming a perpendicular groove or depression in the centre of the forehead. The peculiar setting on of the horns with the skin and hair covering them up a little way above the actual root makes the head appear longer than it really is.

The eyes are quick, but not large or prominent; they are usually black, but at times they have a red or bloodshot look about them.

The ears are yellow within, neat and short for cattle of the size, and taper rapidly from a good breadth to a sharp point; they project at about right angles from the cheek.

The tail is nicely formed and tapers like a whiplash to the black terminal tuft of hair.

The hump and dewlap are both well developed.

The back line is straight from the shoulder to the loins where it droops.

The hoofs are small, hard, and well formed.

The ribs are well rounded and deep, yet the belly is not too large to interfere with active work.

The shoulders are remarkably neat, and the bones of the leg fine, flat, clean, and race-horse-like. On account of the bones, the muscular forearm does not appear massive in proportion to its actual strength.

The breed, as a whole, occupies among cattle a position for form, temper and endurance, strongly analogous to that of the thorough-bred horse among horses. The animals representing it are light in build, and their greatest defect is their moderate size.

—Extracted from the *West Indian Bulletin*, Vol. 8, 1907, pp. 233-34.

II

The Conservation of Activity in Papain

The precise nature of the enzymatic activities of *Papain* has been the subject of considerable uncertainty and disagreement. Pending clarification of various problems, a practical interest attaches to a United States of America

Patent (No. 2,257218) entitled "Process for the preparation of Papain". It is stated that the new process results in a product which retains nearly all the original activity of the latex and may be stored for many months without apparent deterioration. The process consists simply in adding common salt to the latex, either before or after it has clotted, mixing thoroughly and then partially drying the mixture, preferably in a vacuum and at a temperature not exceeding 55° C. The quantity of salt used may vary within limits, but with the latex of average water content, may be about one-tenth of the weight of the fresh latex.

—*Bulletin of the Imperial Institute*, London, Vol. 39, No. 4, October-December 1941, pp. 372-73.

III

Food Value of Molasses

Cane molasses contains more iron than our bodies can use, than any other food yet discovered. It also supplies other valuable food substances and vitamins more cheaply than from any other source. In moderation it greatly improves flavour and as in the case of feeding molasses to stock, it acts as a relish and aids in making otherwise uninteresting food palatable. It is not uncommon to hear medical men say that they would have fewer cases of anæmia, if people would only take the simple (and much cheaper) precaution of eating a little cane molasses, treacle or brown sugar each day.

—From *The Sugar Producers' Review*, Queensland, Aug. 15, 1941, quoted in *The International Sugar Journal*, March 1942, p. 79.

IV

Oil Extracted from Tomato Seeds

From Brazil come reports that the composition of the tomato seed has been analysed and it has been determined that the oil content has commercial value. In addition to being nutritious on account of its high vitamin content, the oil can be used as a drying agent in the manufacture of varnish. It is said that 18 per cent. of the oil can be extracted, leaving a nutritious residue for animal consumption and organic fertiliser.

—*Agriculture in the Americas*, March 1942, p. 57.

V

Motor Fuel produced from Sugarcane

Experiments conducted at Lousiana State University by Dr. J. W. Jean, have led to production from blackstrap molasses of motor fuel called Jeanite. While not competitive in price with gasoline, the product is believed to have potential value for the several American Republics, which have no petroleum but do have extensive sugarcane industries.

Most other experiments in the use of grains and similar products for motor fuels have involved the production of alcohol for blending with gasoline. The new process avoids the objections of this procedure by producing entirely from molasses, a fuel which is practically identical with gasoline in fuel value and octane rating.

—*Agriculture in the Americas*, March 1942, p. 58.

Britain's Wartime Food Production Drive

BY

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To understand properly Great Britain's wartime drive for food production it is necessary to know something about the peacetime situation. Great Britain had a population of some 46 million people in 1937 of which 335,000 were actual farmers, and with their workers made up a total of 1,030,000 occupied in agriculture. If the families were added in, less than 10 per cent. of the population were directly dependent on agriculture. Yet this small number of people produced some 40 per cent. of the food of 46 million people. It was a great performance, better than in any other country in Europe: one worker fed on the average no fewer than 17 people. But the 40 per cent. home production was not evenly distributed over all foods; we produced the whole of our liquid milk and potatoes, and half our meat, but only about 25 per cent. of our wheat and 10 per cent. of our butter. British farms are in the main small: more than 80 per cent. of them are 150 acres or less in area; but the farming units are remarkably stable, being mainly the area of land that one man can adequately supervise. In peacetime the main output of British farms is livestock products, the value of which in recent years was £150 million out of a total value of £220 million for all farm and market garden produce for England and Wales; livestock thus represented 70 per cent. of the total value, farm crops about 15 per cent., and fruit, vegetables and glasshouse produce also 15 per cent. Our cold, wet climate imposes a high standard of nutrition, and the quantities of meat eaten were higher than anywhere in Europe.

Wartime Changes: A New Dietary

When war broke out it was clear that we could not indefinitely continue to import 60 per cent. of our food, but it was also clear that we could not produce it all ourselves. Our peacetime dietary required about 1·6 acres of cultivated land per head of population, and we had not got more than about 0·6 or 0·7 acre per head. Something could be added by reclaiming land at present waste or at least non-agricultural, but the possible increase was not great and was more or less offset by loss of agricultural land for aerodromes, camps, etc. Two courses of action were adopted. Our national dietary was changed so as to reduce the consumption of meat, butter and imported fruit, all of which take up considerable shipping space: correspondingly there had to be an increased consumption of vegetables and potatoes. At the same time the most intensive production of grain, potatoes and vegetables was organized. Of all things national dietaries are the hardest to alter: people are extremely conservative in matters of food, so the change had to come slowly. First of all the dieticians were set to extol the merits of potatoes and vegetables; the nation had to be made "vitamin conscious". Here the B.B.C. with its so-called "Kitchen Front" played a great part. War broke out for us on Sunday, 3 September 1939; eighteen weeks afterwards on 8 January 1940, rationing

of food began, but at first it was very mild, affecting only bacon, butter and sugar; the cuts were not severe and were hardly felt. Then on 11 March 1940, meat was rationed but not poultry, rabbits, game, fish or meat "offals", and in any case the allowance was ample; there were always supplies of the unrationed foods. Not till the end of 1940 did rationing much restrict our old food habits; even now (April 1942) we really have nothing to complain about: the weekly ration for an adult includes about 1½ to 1¾ lb. (according to price) of meat of various kinds, including bacon; 8 oz. of fat (*i.e.*, 2 oz. butter, 6 oz. margarine, 2 oz. cooking fat); 3 oz. cheese (but agricultural and certain other workers and vegetarians have 12 oz.); 8 oz. sugar, 2 oz. tea, 4 oz. preserves (jam, marmalade, syrup, treacle or mincemeat, but not counting honey); milk 3 pints weekly (but extra for children, expectant mothers, invalids, etc.). Tinned and dried foods are rationed on a point system—24 points are allowed per month and these can be expended in a great variety of ways—a tin being priced at from 1 to 16 points according to its contents. Eggs are not rationed but allocated: the difference is shadowy—there were 3 per head during March. Fish, however, is not rationed, and is available in moderate quantity; so also are various so-called meat offals, liver, sweetbreads, hearts and game. Moreover, meals in canteens and restaurants do not count and many of the men have at least one meat meal a day out, as do the children at school. Further, home-produced food does not count.

New Home Producers

Many people are now growing potatoes, vegetables, and fruit; they keep poultry to give eggs, bees to produce honey, and rabbits to increase the meat supply: some also keep goats to furnish more milk. All this is a complete addition to our old supplies. This additional home production of potatoes and vegetables has been a very great advantage. It has saved a great deal of transport, which, under present conditions, is extremely important, and it has ensured that a large number of households have some at least of their food always on the spot and always in good fresh condition.

From the outset the new food producers were encouraged to grow a variety of vegetables and especially to include any that particularly appealed to them. The B.B.C. arranges weekly talks on the management of the garden, while in the daily "Kitchen Front", recipes are given for serving up the vegetables in newer and more attractive forms. So enthusiastically has the call "Dig for Victory" been accepted that much open unused ground in towns and villages, derelict or half-used fields, parks, forecourts and other patches of land have been dug up and made to grow vegetables and potatoes. Demonstration allotments have been set up and assistance is given in a variety of ways to the newcomer. At mid-March 1942 Mr. Hudson stated in the House of Commons that we now had nearly 1,750,000 allotments, practically double the pre-war figure, in addition to 2 million to 3 million private gardens, and the allotment holders and private gardeners between them are producing some £10 million to £15 million worth of vegetables. The movement is still spreading, for we have been warned that next winter will be a trying time, and each man must do what he can to grow a reserve of food for himself.

New Farm Production

Life is so strenuous, however, and wartime duties such as Home Guard, Civil Defence, Air Raid Protection and Fire Watching are becoming steadily more insistent, that the allotment and garden effort is not likely to expand greatly. For the bulk of our home-produced food we must look to our farms. Our new dietary, allowing for the supplements due to the home garden and allotments, requires less than the 1·6 acres needed by the old one, and in consequence we have automatically been able to increase the proportion of home-grown foodstuffs and to supply considerably more than the 40 per cent. fed in peacetime; this would have been the result even had no increase in food production occurred.

But alongside of this changed dietary there has been an intensification of food production. Grassland is less productive of human food than arable land and a considerable area has, therefore, been ploughed up. In peacetime the United Kingdom had 13 million acres of arable land and 19 million acres of permanent grass: at mid-March 1942 Mr. Hudson informed us the figures were reversed and there soon would be 19 million acres of arable land. The additional 6 million acres had gone into a variety of crops: oats had taken about 1½ million, the wheat acreage had been increased by more than 550,000 acres and the potato crop by more than 300,000 acres over the peacetime acreage of 1·6 million of wheat and 700,000 of potatoes. Vegetables also increased from 2·5 million tons in 1938 to 4 million tons; Sugar beet, it was hoped, would be raised by 60,000 acres to the 405,000 which was all the existing factories could cope with.

These great increases in the areas of arable crops would have been impossible but for a large increase in the number of tractors. Here the young countryman's machine-mindedness has been a great advantage. The present generation of young people has been brought up alongside of mechanical devices and thereby gained a high degree of familiarity with them; as children they had mechanical toys; as boys and girls they had bicycles, later on motor-cycles and wireless sets and the chance of watching motor cars and tractors dismantled and reassembled at the local garage. So the introduction of the tractor and electric motor on the farm came as a perfectly natural development, and there is little of the wastage due to inattention or wrong use that one sometimes sees in other countries. There are now said to be 100,000 tractors in use in Great Britain and it is further stated that our farms are the most heavily mechanized in Europe. Young women have taken remarkably well to tractor driving and the reserves of woman power in the country are still considerable.

Milk and Meat Output

In the last War (1914-18) we also increased greatly our area of arable land and our output of wheat and potatoes but this was done at the expense of meat and milk production, both of which fell off considerably. In this war the situation has been very different. Official figures are not available, but it seems clear that there has been practically no reduction in milk output; indeed last December the official estimate was a reduction of about 3 per cent. only. Milk has been rationed because consumption rose: according to the

Duke of Norfolk it is 25 per cent. up; more than ever before is earmarked for children and as far as possible steps are taken to see that they get it. The result is that our children will come well out of the war with health unimpaired and not suffering from the malnutrition and deficiency diseases that the Germans are inflicting on so many of their child victims in Europe. The numbers of cattle remain high: there has been some fall in the number of sheep, pigs and poultry, though it will not be difficult to restore these after the war; pigs and poultry in particular multiply very rapidly, and the popular sheep of to-day are the prolific Border-Leicesters which are usually crossed with a Southdown ram or an Oxford or Hampshiredown to give the type of lamb wanted for the local market. This season, 1942, promises to be one of the most prolific on record; in our flock of 200 breeding ewes at Rothamsted we have already had 2 sets of quadruplets, 18 sets of triplets and many sets of twins. It would be interesting to speculate on the reasons for this: the shepherd associates it with the abundant growth of good grass last autumn when the rams were running with the ewes; on the other hand some of the physiologists do not accept this view. The output of meat has suffered, but there are no official figures to show by how much: probably, however, less than in the last War.

The reduction of imports has greatly affected animal nutrition also: prior to the war we imported about 25 per cent. of the starch and protein equivalent required by our livestock. Much of this is now unavailable. Moreover, the closer milling of the wheat has reduced the supply of wheat offals to the animals. The ploughing up of the grassland deprives them of much of their protein equivalent and the arable crops grown instead do not fully supply the deficiency, although they go a long way. Also the arable crops furnish food both summer and winter while the grass provides a great flush of food in summer and much less in winter. This inconvenience is being mitigated by an extension of silage, in the making of which molasses is used with advantage. Grass drying would have been useful but it was not practicable under war conditions partly through lack of driers and other equipment, partly through shortage of oil fuel on the farm. In consequence of these various difficulties our animals have less protein and starch equivalent than in peacetime and so give lower yields of milk and of meat, and also the meat is not so well finished: it lacks the rich juiciness of the peacetime product.

New Administrative Organization

When the war began in September 1939, our agricultural position was certainly in some directions worse than it had been in August 1914 when the earlier War had started. We had fewer agricultural workers and fewer acres under the plough than ever before and our farmers were disheartened and financially handicapped by a series of difficult years. But on the other hand we had developed a good service of advisory officers. County agricultural staffs were in touch also with advisory scientific staffs of chemists, entomologists, plant pathologists, economists and others, who were centred at universities or large experiment stations where adequate appliances would be made available; and the agricultural departments and experiment stations were well staffed with scientists all anxious to do their best to help in the war effort. At the outset

the Ministry of Agriculture decided to set up War Agriculture Committees in each county and to give them extensive powers of controlling the operations of the individual farmers. Each man is told how much grassland he must plough up; if he has not got the implements the work will be done for him and charged to him. He is also told what he should grow, though considerable latitude is allowed to ensure the fullest chance of success. A survey has been made of all the farms and they have been graded as A (excellent), C (poor) and B (intermediate). Enquiry is made as to why the C farms are so poor; if it is a case of ignorance and incompetence the farmer can be dispossessed and the land taken over by the War Agricultural Committee; if on the other hand it is due to some mechanical hindrance the Committee has power to put this right. It is gratifying to record that C farms are not numerous and that dispossession has been rare. In many instances useful help has been given and productiveness increased. The War Agricultural Committees have been able to undertake large-scale improvements, particularly drainage, which for some years past have been beyond the power of individual owners. Great Britain practically never suffers from drought (except in the Eastern Counties in spring); our troubles are usually from too much rain and from water seeping down from higher ground and so making the land waterlogged. Drainage schemes on a proper scale effectively raise the productiveness of the land, and a number of them have been put into operation. The Committees have also ploughed up considerable areas of land which had not been cultivated for many years; gorse-covered commons have been converted into potato fields, the commoners' rights, which all through the ages had prevented cultivation, being waived in the interests of food production. The shortage of grass has stimulated the reclamation and improvement of the so-called "rough grazings", land which supplies a certain amount of grazing to animals but not enough to justify the expenditure of time or money on it. Methods have been devised for improving it and converting it into useful grassland. Then too, supplies of fertilizers and of feeding stuffs are strictly controlled and allocated to the different countries. Thanks to our highly efficient chemical industry we have almost unlimited supplies of sulphate of ammonia, and to that extent we are much better off than in the last War when nitrogenous fertilizers were very scarce. But we have no such large supplies of phosphates or of potash, and so it has been necessary to ensure that these shall be used to the best advantage. The use of potash is restricted to certain crops only: potatoes have a high priority, and, among vegetables, tomatoes and brassicas. So feeding stuffs have to be allocated. Priority is given to milk production, but even so dairy farmers are expected to grow sufficient fodder crops and cereals to provide the first half-gallon of milk per day; they can then obtain concentrated feeding stuffs to increase their output. It is announced, however, that the position will deteriorate next winter and that farmers must then provide for the first gallon of milk per day.

How it is Financed

Agriculture is, however, a business and farmers can increase their food production only if they have the necessary funds. This has been provided by fixing prices which allow a reasonable margin under average conditions of

farming. Farm wages have, of course, risen, and now stand at a minimum of £3 weekly for a man, the actual payments being of course higher because of overtime or special duties. Prices of farmers' requirements have also risen but not inordinately, and they are in any case controlled. The prices paid for farm produce take account of these costs and still leave the farmer under average conditions with the possibility of coming out safely. Farmers under better conditions can, of course, make considerable profits but these are taken by the Exchequer in the form of excess profit tax and income tax. Patriotism has had to replace profit as the motive for high output and fortunately for the country both farmers and farm workers are responding well to the demands made upon them. We are warned that next winter will be the most serious of all the war winters and in particular that the food situation then will be worse than anything yet experienced. But instead of depressing our people this has only stirred them to greater zeal and activity, and everywhere one sees food production in full swing to ensure that, whatever happens, the country will always have sufficient food to be able to continue the fight till victory is attained.

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1519-42.—Printed at The Bangalore Press, Bangalore City, by G. Srinivasa Rao, Superintendent